remove the snow and ice. The situation was somewhat improved when the month closed but still very bad generally.

More or less drifting occurred through the month which also interferred with street, highway, and railroad transportation. The first heavy snow, on the 5th, drifted some, causing general delays and blocking country roads for several days. Street-car service was paralyzed for a time, some lines not being able to resume operation for a day or two. Light to moderate snows fell at frequent intervals through the rest of the month, accompanied by considerable drifting which would refill where snow plows had removed the snow. Some interurban busses were unable to run at all during the rest of the month, especially north and east, due to blockades. Trains were frequently off schedule from one to several hours, and a 36-mile branch of one line was entirely closed for practically three weeks. Crews operating snow plows north of the city encountered drifts as deep as 10 feet. Colesburg, a small village about 30 miles northwest of Dubuque, was completely isolated for nearly three weeks. Snow plows operated vigorously day and night for practically a month in an effort to open the roads throughout the territory around Dubuque, and to clear the streets in the city.

Of course, the persistent cold weather was a heavy contributing factor in that only slight melting of the snow occurred and this was immediately followed by freezing and consequent hardening of the snow, which made its removal extremely difficult. Again, on the 22d light rain formed an incrustation upon the snow and also encouraged the hardening of the whole cover, which retarded melting and evaporation later and increased the difficulty of removal.

It was believed a week ago that $200,000 would be a conservative estimate of the loss to business and damage to property resulting from the snows of January in Dubuque and surrounding territory. It has just now been announced that the roofing concerns of the city have placed an estimate of $100,000 upon the damage to property resulting from accumulated snow on the roofs, alone. Gigantic icicles measuring from 5 to 15 feet in length and as large as a man's body have been a common sight about the city and many can still be seen at this writing hanging from the eaves, the most of them having been removed by workmen to prevent possible injury to life or property.

551.506 (73)

NOTES, ABSTRACTS, AND REVIEWS

An exceptional January.—January, 1929, was an exceptional month in several respects but primarily in the unusually irregular sequence and rate of movement of cyclones and anticyclones. The following details of two cases will illustrate this fact. The cyclone of the 3d–8th (see Chart III) came from the Pacific and entered the continent over the coastal waters of British Columbia and the State of Washington on the 3d, followed the course indicated on the above-mentioned chart was centered at Port Burwell, on Cape Chidley, which forms the headland of the south side of Hudson Strait where it debouches on Davis Strait, with central pressure of 28.02 inches at 7 p. m. of the 7th. Pressure at Godthaab, Greenland, at this time was 28.86 inches. The remnants of this immense depression of the barometer could be found three days later far to the westward over Hudson Bay, but the most remarkable case of the displacement of a cyclone center to the northwest by high pressure to the northeast took place between the morning of the 14th when the cyclone center was over Sable Island with pressure 29.38 inches, and the morning of the 19th when it was filling up over the west shore of Hudson Bay with pressure of 29.44 inches, at Churchill. The second cyclone was that of January 18–21. See path as traced on Chart III. Both of these cylones in the 24-hour movement from Kansas City, Mo., in approximately the geographical center of the United States traveled at very great speed and central pressure decreased 0.52 and 0.36 inch, respectively. The first one moved very close to 1,000 miles and the second approximately 1,500 miles. The dynamic considerations involved in this rapid movement and large diminution of central pressure would form the subject of special inquiry were the details of the process known. Unfortunately they are not available and only surface observations are at hand.

These show that the pressure distribution on January 18 was quite favorable to a rapid movement of the center, more so than on January 5. In both cases the centers moved into a region in which there was a rise in surface temperature of 20° F. or more in 24 hours.

Another exceptional feature of the month was the scarcity of snow over the eastern seaboard south of New England. In Washington, D. C., for example but 0.3 inch fell during the month and the winter's total is but 0.5 inch up to this writing, February 11. On the other hand snow was abundant in the northern border States and the Rocky Mountain region. See Chart VII.

Mean temperatures of the month were widely divergent; in the upper Missouri Valley they were as much as 10° F. below normal and in southeastern States 4° above. See Chart I. Evidently much cold air overlaid southern Canada and the northern border States. The trigger that served to release masses of this air in a southward gravitational flow was the eastward movement of cyclonic areas across the Rocky Mountains of which a relatively large number was noted, many of which failed in crossing the continent. It so happened that the great majority of these areas followed a course that took them northeastward across the Great Lakes. Since pressure over the western Atlantic off the Carolinas, as at Bermuda, was high throughout the greater part of the month cold air was prevented from entering the Atlantic seaboard to any marked extent. The daily changes were unusual, in one case an area of at least 29,000 square miles in extent experienced a rise of 20° or more in 24 hours and this was immediately followed by a change in the opposite direction in the ensuing 24 hours. These and other unusual changes that might be mentioned will give some idea of the tribulations of the forecaster who undertook to anticipate the weather of the month.—*A. J. H.*

Cold weather in Europe during January, 1929.[1]—Pressure was much above normal over the whole of western Europe and at Bermuda, the greatest excess being 24.2 mb. at Isafjord, while pressure was below normal over the North Atlantic, where the greatest deficit was 11.1 mb. at Horta. Temperature was below normal except in the north of Scandinavia and in Portugal, being as much as 6° F. below normal in south Sweden and at Spitsbergen, while precipitation totals were deficient except in Spitsbergen and eastern Sweden.

Heavy and continuous rains accompanied by thunder, snow, and hail storms during the first few days of the

[1] Reprinted from The Meteorological Magazine, London, February, 1929, page 24.

month resulted in floods in many parts of Italy. The Tiber is reported to have risen to 50 feet, making it the worst flood experienced in Rome since February, 1915. Other large towns to be severely affected were Pisa, Florence, and Naples. Cold weather with heavy falls of snow occurred generally over the whole of Europe even as far south as the Riviera during the first half of the month. At Majorca the temperature was almost down to freezing point but the weather was sunny. In Central Europe the snowfalls were so heavy that railway and telegraph communications were broken in several places. The ice on the Elbe above Hamburg was so thick that the river could be crossed on foot; navigation on the tributaries of the Rhine also came to a standstill about the 16th. For the first time since 1917 skating was permitted on the lakes in the Bois de Boulogne (Paris) on the 17th and 18th. After a milder spell lasting about three days heavy snow fell generally on the 25th, and as far south as the Riviera on the 25th, 27th, 28th. Severe cold was experienced during this time with violent storms in Yugoslavia.

On the 23d and 24th after a week of severe weather there was a heavy fall of snow in Jerusalem. Gales and snowstorms accompanied by high tides caused much damage along the northeastern coasts of Japan during the first week of the month.

In the same issue of The Meteorological Magazine, under the caption "The winter of December, 1928, and January and February, 1929" the following explanation of the severe cold in Europe during February, 1929, is given:

> At the beginning of February a large area of low pressure developed over the North Atlantic, and pressure over Iceland fell rapidly, but in the meanwhile an extraordinarily intense anticyclone had developed over northern Russia, pressure reaching nearly 1,060 mb. [31.30 inches] over the Urals on January 29. The anticyclone continued to advance westward, and has occupied northern Russia and the Baltic region during the first half of February. It is an offshoot of the great winter anticyclone of Siberia, with which it is connected by a ridge of high pressure in about 60° N. latitude, and on its southern side a great current of intensely cold air from Siberia drifted across Europe.
>
> The second week of February was accordingly intensely cold over central Europe, and at this writing [probably about February 15] the cold shows no sign of abating. * * *

ATMOSPHERICS AND TROPICAL CYCLONES

551.515(213)

By FATHER E. GHERZI, S. J., *in charge weather and seismic services*

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In a research published in 1923 concerning the radio reception in Zi-ka-wei of the Bordeaux press and time signals, during the typhoon season, we had the occasion of advancing that the tropical cyclone, contrary to the extratropical cyclone, is composed only of equatorial air.

Further data obtained from ships, which had passed through the center of these powerful and destructive centers, confirmed our first idea and recently also the Japanese meteorologists have agreed that in a typhoon there is no temperature discontinuity. (Compare, for instance, The Memoirs of the Imperial Marine Observatory Kobe, on the Typhoon of the Far East, by Yosiki Horiguti. 1926 to 1928.)

We had advanced our theory on the ground that in the radio reception, those disturbances so well known to all the radio operators, which have been called "statics" or "strays" or "atmospherics," had really decreased with the approach and especially in the central area of these tropical cyclones.

In an article published by the Air Ministry of London, in the Marine Observer through the kindness of the marine superintendent, Commander L. A. Brooke-Smith, in August, 1925, we asked that similar researches might be made elsewhere in order to compare the results.

Later on the U. S. S. cutter *Kittery*, in a campaign around the Antilles had the occasion of making some observations, with a recording loop receiver, not far from the central zone of the so-called "Miami cyclone" (namely a typhoon or tropical cyclone).

The conclusions given in a "Notice" published in the Pilot Charts issued by the United States Hydrographic Office, showed that in that cyclone the "atmospherics" had been very strong all over the typhoon area.

The ship herself had not been in the center and even not in the real stormy region as her barometer's lowest reading had only fallen to 29.56 inches. This barometric pressure (every sailor will admit) is quite near the normal value for the tropical regions during these months of cyclones.

So much that we declined to admit that the experiences of the U. S. S. *Kittery* did really consider the problem long the line which we think is the right one, and which we have been able to follow, owing to the kindness of the captains of the ships which had really gone through the centers of the typhoons quoted by us. (Compare The Marine Observer, August, 1925, and August, 1928.)

Since Sir Napier Shaw in his Manual of Meteorology, Volume II page 371, edited in Cambridge in 1928 [1] seems to admit that the U. S. S. *Kittery* reports would contradict, in some ways, our own experiences for the far eastern seas, we think convenient to state again how the research should be conducted for making a comparison with our own possible.

In the typhoon region (taking this in a general sense) three concentric zones should be admitted.

1. The zone where the circulation of the wind begins to be cyclonic. There we have found "atmospherics" and local thunder storms, which are, we think, by and by dissolved by the approach of the real typhoon zone.

2. The zone where the cyclonic circulation is real and fresh but the barometer has not yet begun the V characteristic of the typhoon barometric curve and the value of the pressure is yet relatively normal, just as in the case of the U. S. S. *Kittery*, concerning the Miami cyclone.

There "atmospherics" are also present but they have been reported as relatively decreasing.

3. The central zone (not only the central part with its characteristic "calm"), with its steep barometric gradient showing a V on the barographic record.

There, according to the examples we have been able to quote in our articles, the "atmospherics" had almost disappeared and in some cases have been completely absent, although there had been heavy and blinding rain squalls and hurricane winds during the time of the observation.

These are the facts already quoted. We would like to know how things happened on ships having gone through the center of the cyclone, in low latitudes,[2] over

[1] "* * * Gherzi has cited instances of steamers passing through centers of typhoons and experiencing no atmospherics * * *. On the other hand reception of Arlington was impossible (owing to static) when the Nassau and Miami hurricanes were between Arlington and U. S. S. *Kittery* in the West Indies seas."

[2] Once a tropical cyclone is on the northeasterly course, some envelopment by polar cold air should be admitted, with corresponding "atmospherics" in the radio reception,